

CLAIMS

What is claimed is:

1 1. A composition comprising:

2 1) a compound of the formula:

3 $A^1(Si[R^1]_2O)_u(Si[R^2][E]O)_vSi(R^3)_2A^2;$

4 2) a compound of the formula:

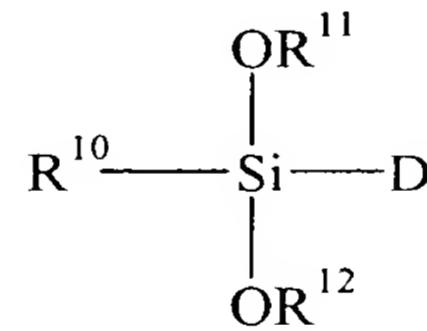
5 $B^1(Si[R^4]_2O)_w(Si[R^5][G]O)_xSi(R^6)_2B^2;$ and

6 3) a crosslinker selected from the group consisting of:

7 a) compounds of the formula:

8 $Z^1(Si[R^7]_2O)_y(SiH[R^8]O)_zSi(R^9)_2Z^2;$ and

9 b) compounds of the formula:



wherein

$R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8,$ and R^9 are independently selected from the group

consisting of alkyl groups of from 1 to 4 carbon atoms;

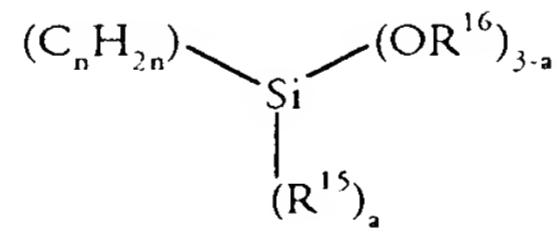
E is a monovalent organic group comprising at least one epoxy group;

A^1 and A^2 are independently selected from the group consisting of alkyl groups of from 1 to 4 carbon atoms and monovalent organic groups comprising at least one epoxy group;

u is an integer from 1 to about 2000;

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21 v is an integer from 0 to about 200;
22 the sum of u and v is from 1 to about 2200;
23 G is selected from the group consisting of hydroxy and alkoxy;
24 B¹ and B² are independently selected from the group consisting of alkyl groups of from
25 1 to 4 carbon atoms, hydroxy, and alkoxy;
26 w is an integer from 1 to about 1000;
27 x is an integer from 0 to about 50;
28 the sum of w and x is from 1 to about 1050;
29 Z¹ and Z² are independently selected from the group consisting of hydrogen and alkyl
30 groups of from 1 to 4 carbon atoms;
31 y is from 1 to about 1000;
32 z is from 0 to about 2000;
33 the sum of y and z is from 1 to about 3000;
34 D is selected from the group consisting of hydrogen, substituted or unsubstituted C₁-
35 C₁₂ hydrocarbon moieties, OR¹⁴, and moieties of the formula:



39 R¹⁰ and R¹⁵ are independently selected from the group consisting of hydrogen,
40 substituted or unsubstituted C₁-C₁₂ hydrocarbon moieties, and OR¹³;
41 R¹¹, R¹², R¹³, R¹⁴, and R¹⁶ are independently selected from the group consisting of C₁-
42 C₆ hydrocarbon moieties;

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43 n is 1, 2, or 3; and

44 a is 0, 1, or 2.

1 2. The composition of claim 1 in the form of an aqueous emulsion.

1 3. The composition of claim 2 further comprising a catalyst.

1 4. The composition of claim 2 further comprising at least one surface active agent.

1 5. The composition of claim 3 wherein the catalyst is selected from the group consisting
2 of metal salts of acids, zinc chloride, magnesium chloride, aluminum chloride, metal soaps,
3 non-polymeric anhydrides, and butyl acid phosphate.

1 6. The composition of claim 4 wherein the surface active agent is selected from the group
2 consisting of non-ionic surface active agents, anionic surface active agents, and cationic
3 surface active agents.

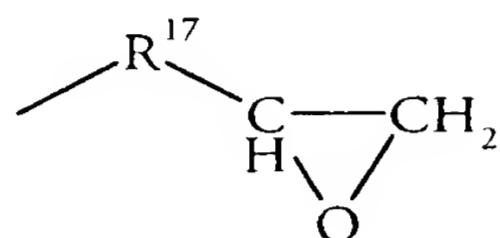
1 7. The composition of claim 1 wherein R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ are all the
2 same.

1 8. The composition of claim 7 wherein R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ are all
2 methyl.

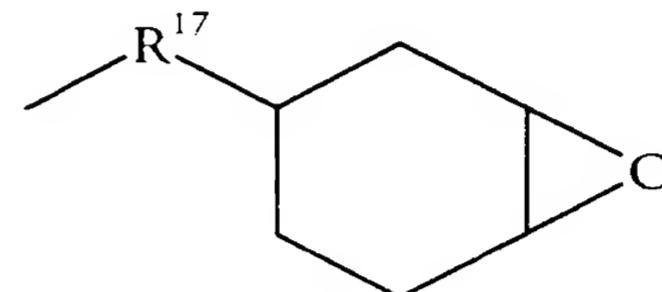
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1 9. The composition of claim 1 wherein E is selected from the group consisting of moieties
2 of the structural formulae:

3



5 and



7 wherein R¹⁷ is a divalent substituted or unsubstituted organic group.

1 10. The composition of claim 1 wherein 3)b) is selected from the group consisting of
2 methyltrimethoxysilane, methyltriethoxysilane, ethyltriethoxysilane,
3 methylpentamethoxydisilylethane, tetraethoxysilane, cyclohexyltriethoxysilane and
4 methyltripropoxysilane.

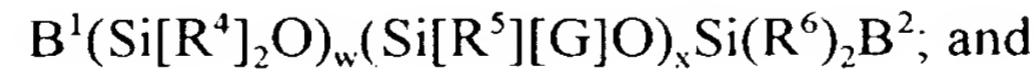
1 11. A process of treating textiles comprising the steps of:

2 A) providing an aqueous emulsion comprising a composition comprising:

3 1) a compound of the formula:



5 2) a compound of the formula:

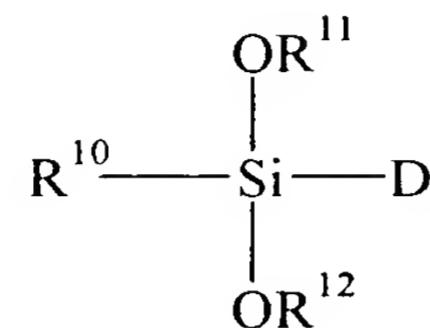


7 3) a crosslinker selected from the group consisting of:

8 a) compounds of the formula:



10 b) compounds of the formula:



15 wherein

18 E is a monovalent organic group comprising at least one epoxy group;

19 A¹ and A² are independently selected from the group consisting of alkyl groups
20 of from 1 to 4 carbon atoms and monovalent organic groups comprising at least one epoxy
21 group;

22 u is an integer from 1 to about 2000;

23 v is an integer from 0 to about 200;

the sum of u and v is from 1 to about 2200;

25 G is selected from the group consisting of hydroxy and alkoxy;

26 B¹ and B² are independently selected from the group consisting of alkyl groups
27 of from 1 to 4 carbon atoms, hydroxy, and alkoxy;

28 w is an integer from 1 to about 100

29 x is an integer from 0 to about 50;

30 the sum of w and x is from 1 to about

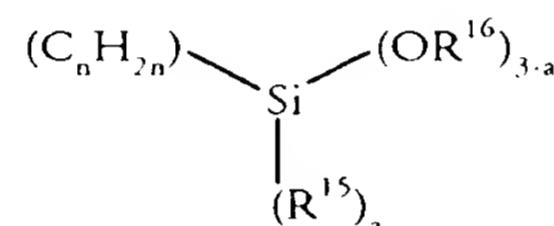
31 Z¹ and Z² are independently selected from the group consisting of hydrogen
32 and alkyl groups of from 1 to 4 carbon atoms;

33 y is from 1 to about 1000;

34 z is from 0 to about 2000;

35 the sum of y and z is from 1 to about 3000;

36 D is selected from the group consisting of hydrogen, substituted or
37 unsubstituted C₁-C₁₂ hydrocarbon moieties, OR¹⁴, and moieties of the formula:



41 R¹⁰ and R¹⁵ are independently selected from the group consisting of hydrogen,
42 substituted or unsubstituted C₁-C₁₂ hydrocarbon moieties, and OR¹³;

43 R¹¹, R¹², R¹³, R¹⁴, and R¹⁶ are independently selected from the group consisting
44 of C₁-C₆ hydrocarbon moieties;

45 n is 1, 2, or 3; and

46 a is 0, 1, or 2.

47 B) providing a catalyst suitable to the aqueous emulsion that will promote a
48 condensation reaction between compounds 1), 2), and 3);

49 C) mixing the aqueous emulsion and the catalyst to form a mixture;

50 D) applying the mixture to the textile; and

51 E) heat treating the textile to form a condensation reaction product of compounds
52 of 1), 2), and 3);

53 whereby the textile has enhanced durability, water repellency, and softness.

1 12. The process of claims 11 further comprising the step of removing an excess of the
2 aqueous emulsion from the textile.

1 13. The process of claim 11 wherein the aqueous emulsion further comprises at least one
2 surface active agent.

1 14. The process of claim 11 wherein the catalyst is selected from the group consisting of
2 metal salts of acids, zinc chloride, magnesium chloride, aluminum chloride, metal soaps, non-
3 polymeric anhydrides, and butyl acid phosphate.

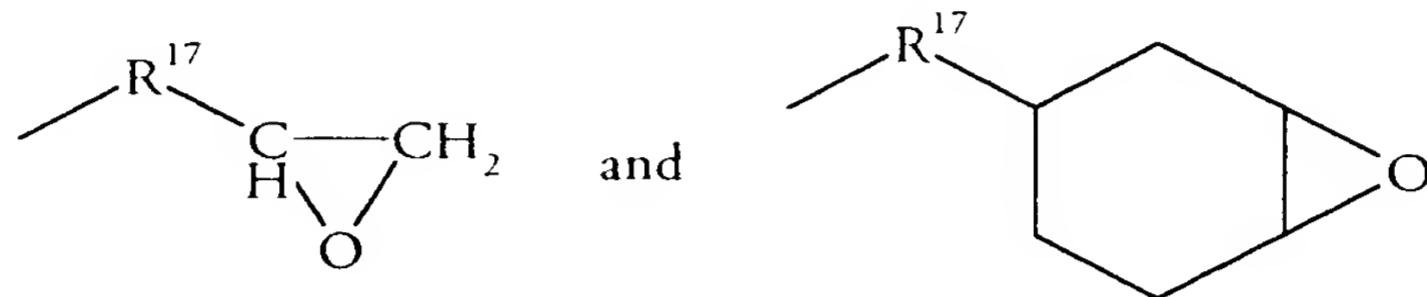
1 15. The process of claim 13 wherein the surface active agent is selected from the group
2 consisting of non-ionic surface active agents, anionic surface active agents, and cationic
3 surface active agents.

1 16. The process of claim 11 wherein R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ are all the same.

1 17. The process of claim 16 wherein R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ are all methyl.

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1 18. The process of claim 11 wherein E is selected from the group consisting of
2 the structural formulae:



9 wherein R¹⁷ is a divalent substituted or unsubstituted organic group.

10 19. The process of claim 11 wherein 3)b) is selected from the group consisting of
11 methyltrimethoxysilane, methyltriethoxysilane, ethyltriethoxysilane,
12 methylpentamethoxydisilylethane, tetraethoxysilane, cyclohexyltriethoxysilane and
13 methyltripropoxysilane.